REMARKS

Entry of this response is proper under 37 CFR §1.116, since there are no new claims and no new issues raised herein.

Claims 1-25 are all of the claims presently pending in the application.

It is noted that Applicant specifically states that no amendment, if any, to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-16 and 25 stand rejected under 35 USC §102(b) as allegedly anticipated by US Patent 5,963,956 to Smartt. Claims 17-20, 22, and 23 stand rejected under 35 USC §102(e) as allegedly anticipated by US Patent 7,010,522 to Jagadish et al. Claim 21 stands rejected under 35 USC §103(a) as allegedly unpatentable over Jagadish, further in view of Smartt. Claim 24 stands rejected under 35 USC §103(a) as allegedly unpatentable over Smartt.

The prior art rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and claimed in independent claim 1, is directed to a method of monitoring continual queries over *moving objects*. A query region representing a continual query over which movements of moving objects are to be monitored and identified in digital format is retrieved from memory. The query region is strictly covered by at least one shingle, so that the query region is completely covered by the at least one shingle and no section of any of the at least one shingle falls outside the query region.

The conventional methods described beginning at line 1 of page 3 of the specification have various problems, including, as described at lines 1-6 of page 5, it is not known whether an object inside a cell is within the boundaries of a query stored in a partial list of that cell.

In contrast, the present invention provides a method by which a query region is strictly covered by one or more shingles, although the shingles are permitted to overlap.

II. THE PRIOR ART REJECTIONS

The Rejections Based on Smartt

The Examiner continues to allege that Smartt anticipates the invention described by claims 1-16 and 25 and renders obvious claim 24. The Examiner also alleges that Jagadish anticipates claims 17-20, 22, and 23, and, when modified by Smartt, renders obvious claim 21.

Applicants again respectfully disagree and again submit that the rejection of record fails to establish a *prima face* rejection for any of the rejections currently of record, since these rejections fail to heed the plain meaning of the claim language, let alone the language as would be understood by one having ordinary skill in the art. The Examiner's Response to Arguments, beginning on page 13 of the latest Office Action, clearly demonstrates the fundamental flaws in these rejections, including demonstrations that the relationships of the cited references are backwards or otherwise convoluted from those of the claimed invention.

That is, at lines 7-11 of page 13 the Examiner explains her basis for the rejections of record: "*A range query, which is what is disclosed in Applicant's specification and used to locate the aforementioned moving objects of the claimed invention is, as understood by one having ordinary skill in the art, a database operation that retrieves all records where some value is between an upper and lower boundary. In the case of the claimed invention, the values that are sought are the coordinates of moving objects within a certain area.*"

Applicants respectfully point out that the above-recited description by the Examiner is both factually incorrect and demonstrates a fundamental misunderstanding about the claimed invention versus Smartt. As demonstrated exemplarily by Figures 1, 3, and 7 of the present application, although a query region might well be defined in some databases as a rectangular region having predefined upper and lower boundaries, it is understood in the art (and defined in the independent claims) as "... representing a continual query over which movements of moving objects are to be monitored...."

A "continual" range query is fundamentally different from a range query treated as a database operation, as referred to by the Examiner. For ease of exposition, let us call "a range query treated as a database operation" as a "database range query". It is arguably

reasonable to describe that a database range query can retrieve the coordinates of moving objects stored in the database within a certain area (if the database is structured to receive moving objects). However, even if the database of Smartt were to be so modified, it would only retrieve those moving objects that are in the database at the time the database range query is executed. It cannot monitor whether or not an existing object has moved out of the query boundary, or whether a new object has moved into the range of the query, since the database operation is completed. Even if the same database range query were to be executed again at a later time, it can only retrieve the coordinates of those moving objects at that later time instant. It simply cannot tell which moving objects are in the query boundary at any time between two executions of the same database range queries.

On the other hand, a continual range query maintains the coordinates of all the moving objects that are within the query boundary at all times, hence the term "continual". This is one of the fundamental aspects of the concepts of the invention in the current disclosure, as expected to be understood by one having ordinary skill in the art based on the terms of art used to describe the claimed invention. Each new object location is used to incrementally update the results of all the continual range queries that are impacted by this new object location due to movement. Hence, we have a complete picture of which moving objects are within the boundaries of which continual queries at all times.

As explained in the text associated with Figure 1, objects move into and out of a query region, and the problem being addressed in the claimed invention is, in one aspect, that of being able to easily determine which objects are currently in these query regions, as would be desirable to know in the exemplary scenarios described beginning on page 2.

In contrast, until reasonably modified using one or more of the seven rationales in *KSR*, the database in Smartt is a static database and the problem being addressed in Smartt is that of assigning a static location for each static object in this static database, including multidimensional objects whose locations are difficult to assign because they include many points in the database space. The method of Smartt provides a solution to this problem by performing a preliminary processing that develops a hierarchy of different-sized tiles over the entire database so that each object is assigned a location in one of the tiers of tiles. These locations are then returned to memory so that subsequent processing of data in this database will be more efficient, since each object has been pre-assigned its location in one of the levels

of tiles.

Therefore, Smartt has nothing to do with query regions that are continuously monitoring for movement of objects into and out of these query regions, let alone covering small regions of the data space by query regions and then making a strict covering of these query regions using shingles.

In order to satisfy the plain meaning of even the independent claims, the Examiner would have to modify Smartts' hierarchical tiling method that is implemented over the entire database by providing a rationale to:

(1) convert the Smartt database into a database that maintains location information of moving objects within a coordinate system defined by the database;

(2) introduce the concept of query ranges into this modified Smartt database, each query range being defined as a bounded area within the overall space over which is monitored which objects move into that query range;

(3) provide a strict cover of shingles over each of the query ranges, as opposed to the cover that Smartt provides over its entire database; and

(4) provide a continual monitoring capability.

Since Smartt suggests none of the above modifications, it clearly fails to anticipate even the independent claims. Moreover, the Examiner makes no attempt to even identify such differences, as would be expected to be well understood by one of skill in the art, let alone make any attempts to rationale such modifications to Smartt as would be necessary to overcome the differences. Therefore, the rejections of record based on Smartt clearly fail to provide a *prima facie* rejection for any of the claims, either for anticipation or for obviousness.

Indeed, none of the elements of even the independent claims are present in either the Smartt reference or adequately addressed in the rejections of record, when the description of the claims is properly construed in the perspective of one having ordinary skill in the art and in view of the description in the specification.

That is, contrary to the Examiner's somewhat loose play on words, as demonstrated by the above-recited explanation from the Examiner, the purpose of Smartt is entirely different from that of providing a continuously-monitored set of query regions, each query region defined as a space within a larger space and being monitored for which objects enter

into and exit this query region. The method and purpose of the Smartt reference is perhaps best articulated at line 55 of column 14 through line 9 of column 15, wherein is explained:

"*One embodiment of the invention is a method of organizing spatial data objects in a map database, including referencing data objects as location points in a region to a coordinate system; separating the region into multiple sub-regions and assigning the data objects whose location point falls within a sub-region to the sub-region so long as no part of the object extends outside the sub-region by a predetermined amount.*

Another embodiment of the present invention is a method of storing spatial data objects to a computer memory, comprising the steps of (1) determining the size of each data object within a coordinate system; (2) assigning each spatial data object to a location point in the coordainate system; (3) calculating the boundaries of a first tier of overlappintg sub-regions of the coordinate system so that each point in the coordinate system is assigned to at least one sub-region; (4) referencing each spatial data object that is smaller than the size of said sub-regions in the first tier to a specific sub-region of the coordinate system based on the location point of each spatial data object; and (5) storing the spatial data objects along with its reference to a specific sub-region to the computer memory."

The reason that the above-recited description of the method of Smartt does not match that of the claimed invention is that the problem being addressed in Smartt is that of organizing large quantities of data (lines 14-15 of column 16). As explained at lines 14-26 of column 1, the reason for such preliminary organization is to increase processing efficiency when there is a large volume of data, a problem that is particularly vexing for objects in two-dimensional space (lines 39-41 of column 1) and even more difficult for non-point objects having dimensions, since there is always some fraction of the object that falls outside a tile boundary (lines 62-67 of column 2).

Thus, as explained at lines 13-16 of column 13, the method of preliminarily processing data described in Smartt permits "*... multidimensional data that is stored with the method and system ... can be retrieved with far fewer processor cycles and disk seeks than in prior systems.*"

Therefore, the Smartt reference has nothing whatsoever to do with the claimed invention and uses an entirely different principle of operation from that of the claimed invention, as follows:

(1) Smartt is directed to a preliminary processing of static data that is then stored, so that subsequent data processing is more efficient. There is no suggestion in Smartt of any repeated application of its methods, let alone a continual monitoring based on time. Nor is there any suggestion that the database is directed to events that change over time and that would require monitoring.

(2) Smartt is directed to an efficient method to assign a location of objects, including multi-dimensional objects, in a two-dimensional space without having to divide objects across tile boundaries. Its hierarchical tile method permits objects to be assigned to a single tile. There is no suggestion whatsoever in Smartt of moving objects or of using tiles to monitor events involving moving objects. Hence, there is no suggestion whatsoever in Smartt of setting up a query region defined in the independent claims as "... representing a continual query over which movements of moving objects are to be monitored", let alone any suggestion of constructing a cover over each query region. Finally, to the extent that the tiles in Smartt are considered to be a covering of some sort, this covering is clearly over the entire database. There is no suggestion (or reason) in Smartt to provide a covering over a smaller, predefined region of Smartt's datebase, let alone a strict covering of that region.

Hence, turning to the clear language of the claims, in Smartt there is no teaching or suggestion of: "A method of monitoring continual queries over moving objects, said method comprising:

retrieving, from a memory of a computer, a query region representing a continual query over which movements of moving objects are to be monitored, said query region being represented in a digital format; and

constructing ... a covering for said query region, said covering comprising at least one shingle, so that said query region is completely covered by said at least one shingle and no section of any said at least one shingle falls outside said query region", as required by independent claim 1, and independent claim 25 has similar language that is likewise not demonstrated by Smartt. Therefore, claims 1-16 and 25 are clearly patentable over Smartt.

Beginning at line 12 on page 13 of the Office Action, the Examiner continues:

"The method of Smartt also uses shingles (as denoted in the claimed invention) to cover a query region, which is simply a predefined area to determine locations of objects (see in particular column 13, lines 17-45, wherein a coordinate system overlays large quantities

of spatial data [query region] and the coordinate system in turn is separated into sub-regions, wherein the tiles are superimposed over the coordinate system that included the spatial data [shingles]."

In response, Applicants bring to the Examiner's attention that lines 17-45 of column 13 clearly describe the prior art attempts to assign a location of multi-dimensional objects in an XY coordinate system, not, as the Examiner alleges, "*... shingles to cover a query region*". As is well known in the art, a query region is something entirely different from this description of assigning locations within the entire database, nor does the claimed invention use the "query regions" in the concept described by the Examiner in the rejection of record, since the independent claims clearly describe and define that a "query region represent[s] a continual query over which movements of moving objects ar to be monitored." Smartt does not suggest this concept of moving objects or of monitoring moving objects relative to a predefined query region in an event space.

Relative to the aspect of the claimed invention concerning moving objects, beginning at line 20 of page 13 the Examiner alleges:

"*The claimed invention requires that the moving objects be monitord by performing continual queries over a specific area to determine whether the coordinates of the objects have changed in relation to their original location.*"

In response, Applicants respectfully bring to the Examiner's attention that the claimed invention is not concerned whether the coordinates of objects have changed in relation to their original location, as alleged. Rather, the claimed invention is directed to determining which objects had moved into or are currently located in the defined query regions (*i.e.*, "continual range query"). Smartt does not have moving objects and, therefore, has no need to introduce query regions set up to monitor which objects enter into these query regions.

Moreover, as clearly described in claims 3, 15, and 21-23, the claimed invention further maintains an object identification listing of those objects whose locations are being monitored, including an identification of any shingles in any of the query regions that currently covers the current location of that object. Smartt does not have moving objects, does not have query regions, and does not have an object identification listing that includes information readily available as to which objects are currently in one of the query regions.

Moreover, because Smartt is directed to the entirely different problem of assigning

locations to static objects, including multi-dimensional objects, within the entirety of its database, there is no reasonable motivation to modify Smartt to incorporate features of the claimed invention that involve moving objects, absent improper hindsight. There is no objective evidence in the rejection of record that it was known in the art at the time of the invention that the elements of the claimed invention (*i.e.,* the differences between Smartt and the claimed invention) were either a known substitute or a known improvement.

Finally, it is brought to the Examiner's attention that the fundamental difference in principles of operation between Smartt and the claimed invention is significant in view of the holding of *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), as described in MPEP §2143.01: "*If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.* "

This holding is clearly significant when, as pointed out above, Smartt fails to demonstrate even one element of independent claim 1. Therefore, Smartt clearly operates under a different principle of operation, and the above-recited holding from *Ratti* clearly demonstrates that it would be difficult, if not impossible, to modify Smartt to satisfy the plain meaning of the claimed invention described by even the independent claims under a rejection based on 35 USC §103(a).

Therefore, claims 1-16, 24, and 25 are clearly patentable over Smartt.

The Rejections Based on Jagadish

The Examiner also alleges that Jagadish anticipates the present invention described by claims 17-20, 22, and 23, and, when modified by Smartt, renders obvious claim 21.

Again, Applicants respectfully disagree.

Jagadish discloses a method for decomposing a string in a database into overlapping "positional q-grams", sequences of predetermined length q, and containing information regarding the "position" of each q-gram within the string. An index is then formed of the tuples of the positional q-gram data.

Applicants respectfully bring to the Examiner's attention that a "string" or "substring" in a database is likewise totally different from either a query region or moving objects, and Jagadish is not, therefore, even relevant to the claimed invention. The Examiner clearly

confirms this distinction, by her response at the bottom of page 14: "*The system and method of Jagadish et al uses string based querying and searching, rather that area based, as disclosed by the claimed invention and the prior art reference Smartt.*"

Therefore, by the Examiner's own characterization of Jagadish recited above, there is clearly no coordinate space in Jagadish for which relative motion is of interest, let alone a coordinate space for which one reasonably would set up query regions to determine which objects have entered into those query regions.

Therefore, claims 17-23 are clearly patentable over Jagadish.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-25, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,

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